ENGINEERing challenge workshop for science museums in the field of Agricultural engineering

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Index

ENGINEERing challenge workshop in the field of agricultural engineering

Workshop ID card

[This ID card will be presented on the website and from this ID you can enter the workshop plan (by clicking on it)]

Name of the workshop: Water for Plant

The Challenge: Transport

The Engineering field: Agricultural engineering

The science field: Plants

Target audience: Families with children from the age of 8

Type of activity: workshop

Duration of activity: 45 minutes

Specific notes: area should be easy to clean (no carpet etc.)

Context

Visitors of museum will build a construction to transport water from a reservoir to a model of a plant. They will make their own model of the plant first. They will try how plants transport water then and finally they will build their constriction.

Maximum number of participants: 12
Number of facilitators (intern): 1
Location: workshop area
Set up time needed: 20 minutes

General objectives

The Engineer Museum Activities:

- ✓ Offer the participants to find and experiment different solutions to solve a "real" engineer problem
- ✓ Give a new perspective on Engineering as a field, a process, a way of thinking and working
- ✓ Introduce and exemplify the EDP (Engineer Design Process: Ask, Imagine, Plan, Create, Improve), or part of it
- ✓ Give the participants the possibility to reflect on what they have done and how the Engineers work.
- ✓ Are based on IBSE - Inquiry Based Science Education and are not gender oriented.

Specific unit objectives

- ✓ Participants will discuss about importance of the plants.
- ✓ People use different materials made from plants which absorb water.
- ✓ It is possible to build a construction to transport water upward with simple material.

Contact Person

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Resources

Material	**Total amount**	**Activity 1**	**Activity 2**	**Activity 3**
Plastic bowl 	2	1		1
Blue ink	1	1		
Food colouring (liquid or powder)	1			1

Wooden stick (skewer) 	6	1		5
Chinese lettuce- leaf  Also fennel, celery can be used	1	1		1
Scissors 	1			
Binding wire	1m			1m
Office tape 	1			1
Piece of Styrofoam (minimum 15 x 15 x 2 cm)	1	1		
Paper tissue-pack 	1		1	
Straw 	10		3	7
Plastic tube (3 cm in diameter) 	2 X 40 cm			2 X 40 cm

Paper- office or from notebook Size A4 (210 x 297)	1			1
Aluminium foil 	2 m			2 m
Plastic sack (trash) 	1			1
Plasticine 	3			3

The workshop

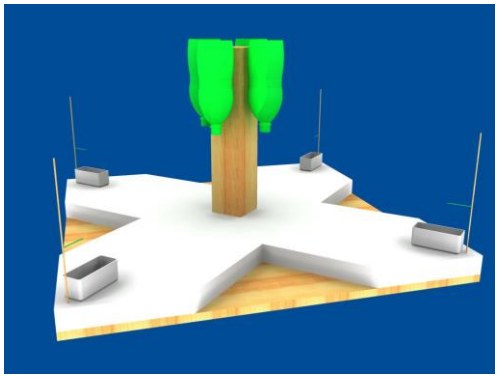
Introduction

1. Welcome the participants and tell who you are. The participants will take a place for work by the table.

2. Employer of the museum will ask the public couple of questions to introduce them into the problem.
   We are going to think about plants today.
   Do you have plants at home?
   Do we need plants for living?
   What do we need plants for?
   What do plants need for living?
   Where do plants gain water?
   How do plants transport water?

Table description:

Place for work will look like as it is on the picture. There are four working places at the table, each for two (three maximum) persons. Technical drawing with size is in the pdf file. It is a wooden desk with polystyrene cross. There is wooden stick in the middle.

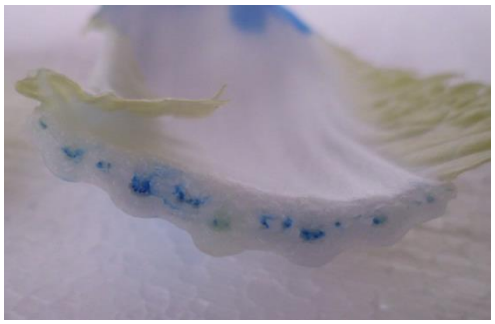


The main activity

Activity 1:

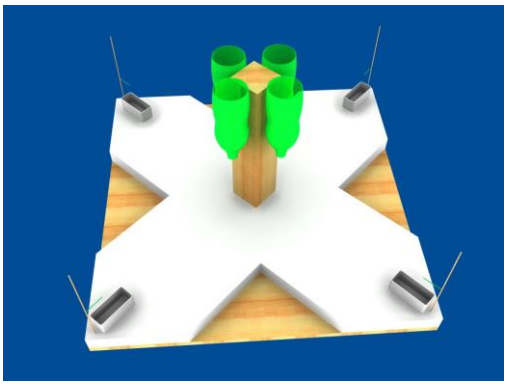
Transport of water in plants- Chinese lettuce.

Participants will pour an ink or coloured water into a plastic bowl. Participants than will take a leaf of the Chinese lettuce and they will put in into the ink or coloured water. They will leave the leaf 10 minutes in the ink or coloured water. The participants will work on the main activity in the time they have. They will make their model of plant. They will take out the leaves after ten minutes and they will cut pieces from the top side of the leaf. Pieces should be 2 – 3 centimetres wide. The participants have to observe every cut, looking for spots of the ink. They will measure how high the ink got when they find the spots. The ink spots look like as on the picture below:



Explanation, what the participants see:

Plants have special tissue for transportation. Water with minerals is transported by xylem. Products



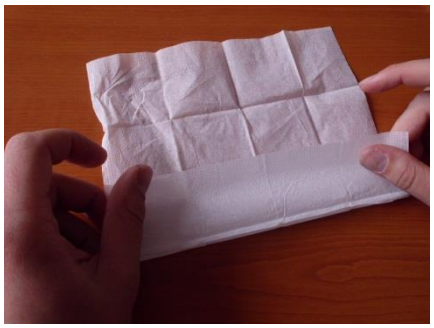
of photosynthesis are transported by phloem.

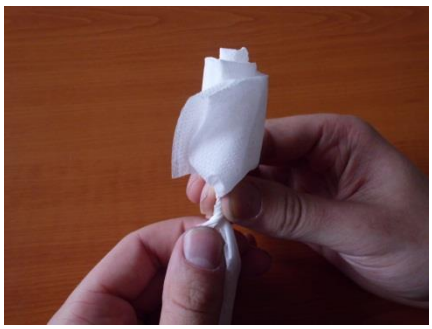
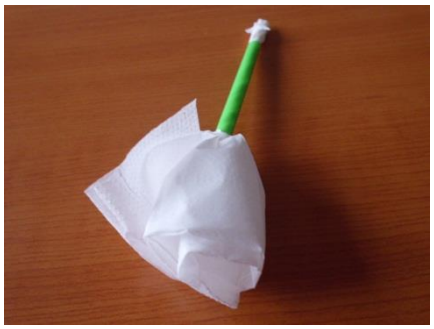
Activity 2:

Model of plant

The participants of the workshop will make their own model of plant. Facilitator will show the participants how to make the model. He will follow these instructions:

The participants will take one layer of the paper tissue. They fold the layer in one quarter and then they roll it very slightly. That's how they will create the flower. Than they have to roll the rest of the paper tissue very firmly, this way they will create the stems. They have to tighten the stems to get them into the straw. A piece of the paper tissue has to be outside at the end of the straw as a root.

Activity 3:

Construction for transport of water

The participants will put their model of plant into a plastic bowl in the corner of a desk and they will consolidate it with the wire to a stick. The participants will get material for the construction and they will start to build. The task is simple. They have 25 minutes to build the construction, but they have to fulfil the criteria:

- Time limit is 25 minutes.
- The construction has to sand alone.
- Water will get to the model of plant.
- No water will be spilt.
- Model of plant will change colour.

Facilitator will pour water into the bottles after 25 minutes and all participants will see if their construction works.

Conclusion

Facilitator will tell the participants that aqueducts were built from ancient times all over the world. There are aqueducts in India, South America, Middle East and more. Assyrians built aqueduct 7 centuries BC it was 80 km long. Very famous are aqueducts from Roman Empire. Only city of Rome used to have 415 km long aqueducts.

Information for the facilitator

Background information

Transport in plants- plants have a system for the transport of water and nutrients. It is called xylem. The second part of this system is phloem which transports the products of photosynthesis. This transport system is growing with the plant, it is well known because we can see it as annual rings.

Capillary- very thin tube

Capillary action- if we put the capillary into a concave meniscus liquid, like water, level of the liquid rises.

FAQ participants can ask

There is one trick in the task, the participants will get only two pieces of plastic tube 20 centimetres long. The participant should find out, they can cut the plastic tube cut into two pieces are this way they can create longer trough.

Problems you can encounter

The participants could be confused how to start, because there is no clue to the solution, except the materials. Facilitator should be able to help them with beginning with open questions.

Tips & tricks regarding the materials

Instructions for this project were clear, all material has to be easy to get, so in this unit all material can be bought in store for workshops.